

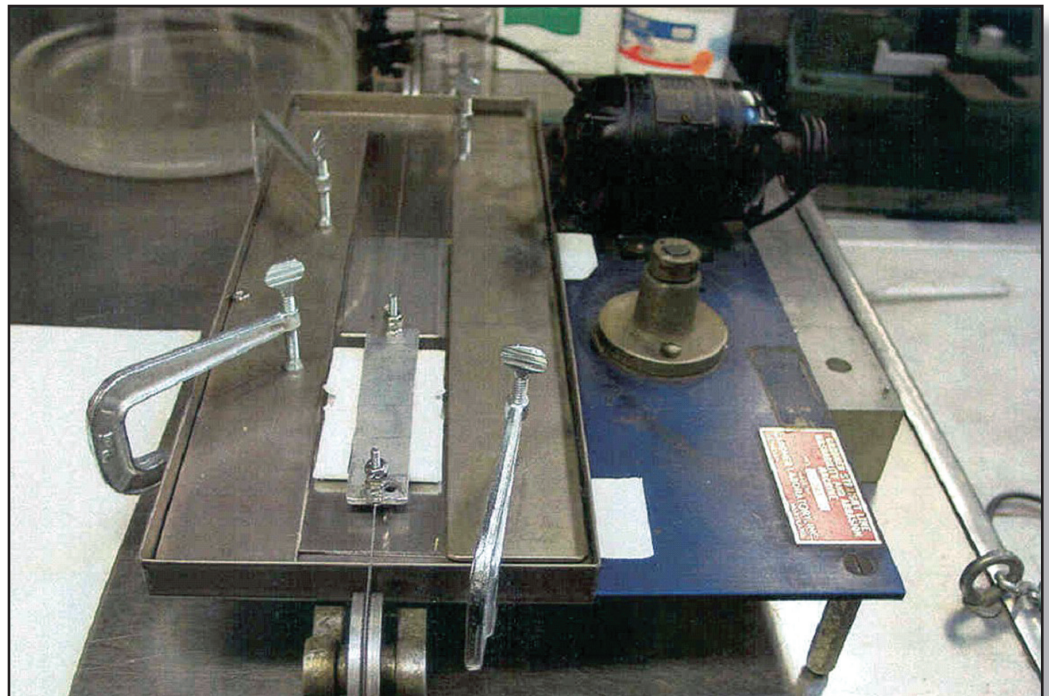


# Air Force Research Laboratory|AFRL

*Science and Technology for Tomorrow's Air and Space Force*

## **Success Story**

### **SCIENTISTS DISCOVER SAFE, EFFECTIVE SOLVENT FOR CLEANING AIRCRAFT OXYGEN LINES**



Researchers from the AFRL Materials and Manufacturing Directorate's Fluids and Lubricants Group tested a variety of available solvents and identified a suitable replacement for Freon<sup>®</sup> 113. The new solvent is more environmentally safe and less hazardous to the ozone, and is currently being incorporated into the Air Force (AF) technical order for oxygen line cleaning.



Air Force Research Laboratory  
Wright-Patterson AFB OH

## **Accomplishment**

AFRL scientists and engineers recently teamed with the Aeronautical Systems Center (ASC) to identify a suitable, temporary replacement for Freon 113, a solvent used for wipe and liquid cleaning of liquid and gaseous oxygen systems in AF aircraft and ground service equipment. Analysis conducted and recommendations made by AFRL personnel revealed that AK 225G offers equivalent cleaning, is compliant with environmental regulations, and is as safe as Freon 113, which was widely used before production of the halogenated solvent was banned due to its ozone depleting tendencies.

## **Background**

Freon 113 TF solvent, 1, 1, 2-trichlorotrifluoroethane (Freon 113) was widely used by aircraft maintainers to clean equipment, including oxygen lines, which deliver liquid and gaseous oxygen within an aircraft. However, tougher environmental regulations have led to the ban of many halogenated solvents because of their ozone depleting tendencies. When production of Freon 113 was discontinued, users desperately sought a robust, environmentally friendly substitute that would perform at least as well as Freon 113.

In many cases, maintainers found that candidate substitutes did not work as well as the previous solvent or had other characteristics that made them less than ideal. In addition, it was often difficult to assess various solvents based on the manufacturers' claims. So, scientists and engineers from AFRL and ASC designed a program to identify replacement solvents for wipe and liquid cleaning of liquid and gaseous oxygen systems. ASC provided funding and leadership for the project.

Seven solvents that were advocated as Freon 113 replacements were evaluated during testing at AFRL; the National Aeronautics and Space Administration's White Sands Testing Facility; the Phoenix Chemical Laboratory in Chicago, Illinois; and Edwards Air Force Base, California. Using Freon 113 as the baseline, engineers conducted several tests to determine the solvents' ability to clean oxygen system components.

Directorate experts evaluated the results of extensive testing and determined that AK 225G, a hydrochlorofluorocarbon produced by Asahi Glass Corporation, would provide an appropriate midterm replacement for Freon 113. The solvent has far less severe ozone depleting tendencies and offers simple wipe cleaning properties equivalent to Freon 113. AK 225G is currently being incorporated into the AF technical order for oxygen line cleaning.

## **Additional Information**

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-ML-19)